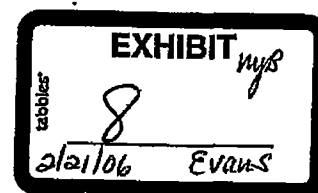


AMPEX

# AVA SERVICE MANUAL

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TED MARSH

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SERVICE MANUAL

AMPEX CORPORATION  
AUDIO-VIDEO SYSTEMS DIVISION

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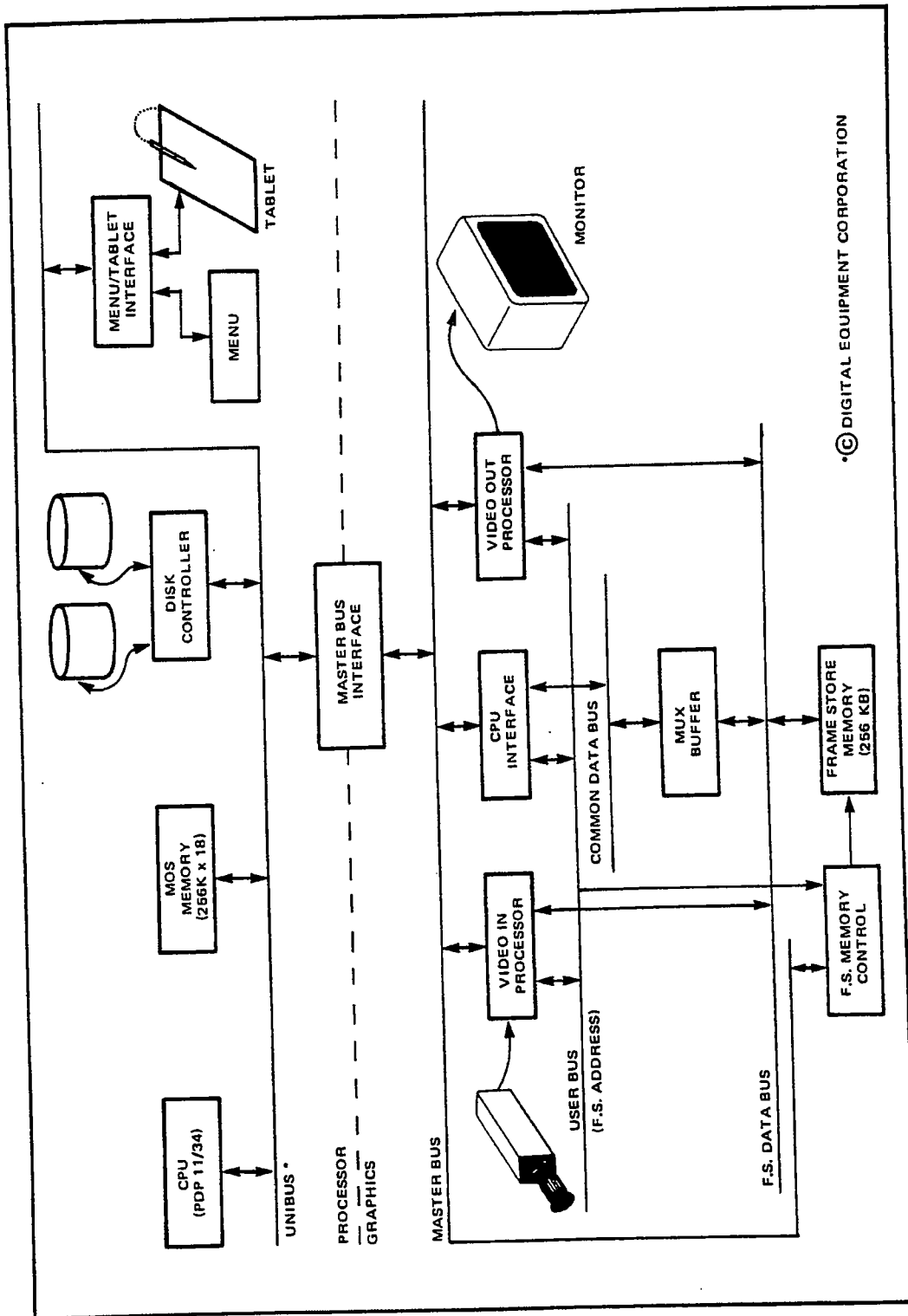


Figure 3-3. AVA Data Path

- 17 -

100  
101  
110  
111

\*  
\*  
\*  
All Components

#### 4-2.4 Frame Store Data Bus

The frame store data bus is composed of 40 lines. There are 32 for the video data component and 8 for the overlay component. Each component requires a separate frame store, and each is transferred on its own bus between the VIP, VOP, and the frame store memory.

Frame store data is multiplexed to the CPUI via the 32-line common data bus by tristate buffer enable selection. The mux buffers physically reside on the frame store memory board. The CPUI can access any one component at a time.

#### 4-3 MAJOR SUBSYSTEMS

In addition to theory discussions, the following subsections include a table of register addresses dedicated to each subsystem. Where applicable, definitions of the control bits or words in each register are provided.

##### 4-3.1 PDP 11/34 Computer

Theory of operation of the central processor (CPU) is given in the Digital Equipment Corporation Central Processor Maintenance Manuals listed in Appendix A of this manual. Options added to the basic PDP 11/34 computer configuration for the AVA system are shown in Figure 4-2 and listed in subsection 4-2.1, Unibus.

##### 4-3.2 CPU Memory

The CPU memory is a Mostek model MK 8015 semiconductor memory having a capacity of 256K x 18 bits. The CPU memory storage is primarily divided between high and low memory, where high and low memory each contain 128K-word addresses. The low end of low memory is used for bootstrap loader. The operating system resides in the next higher block of addresses, and above that the balance of low memory is devoted to program storage.

The lowest portion of high memory is occupied by the stack. The balance of the high memory sector is for memory map to/from I/O devices. Everything that is transferred in or

\*Reserved for future application.

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Richard - This is for your approval before  
going to print from Brian Tenham

The PAINT BOX

Quantel's DPB 7000 Series Digital Paint Box

Excellent - very minor  
mods on page 6a, 8 & 9.



The complete system for creating  
television fine art and graphics

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A complete graphics studio on-screen - Quantel's Paint Box

2

Quantel's DPB 7000 Series Digital Paint Box is a unique creative tool for artists who need to work freely and directly in the television medium. True to Quantel tradition, this is not just another video graphics machine - the Paint Box is a technological breakthrough; a second-generation system. The totally natural look of its pictures alone sets it apart, while its versatility is, quite simply, marvellous.

In the Paint Box, Quantel has constructed a canvas, with paints and its own mixing palette, as well as all the tools and facilities a graphic artist could need and more. Whether creating fine art on the TV screen itself or capturing and freezing video; whether combining its own library stills or perfect retouching of any picture; and whether producing stencils or adding graphics and text with the power of electronic scissors and paste, Quantel's is indeed the ultimate Paint Box.

Yet the technology behind this machine is completely hidden, allowing the user to feel completely at home and to concentrate on his creative work. So that stunning effects, including brilliant animation, can be achieved quickly and easily, saving considerable time and giving excellent results.

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Total fidelity

In appearance, the Paint Box gives little hint of its underlying power - it looks similar to first generation systems but without a large computer. There's a touch tablet on which to draw with an electronic stylus, a TV screen acting as the ideal canvas, a keyboard for occasional use, a Winchester disc for picture storage, and Quantel's powerful brown box, quietly handling all the work. But when the artist starts to use the Paint Box, he finds that it is quite different, and that the images he can create are perfectly natural.

This is true second generation artistry. With the Paint Box, lines drawn by the artist are not subject to the all too familiar serrated look; even close to the horizontal they remain perfectly smooth. To make the artist more at home, the stylus has 'feel' - it is pressure sensitive, and the more pressure is applied, the more paint is deposited, just like a real brush. And where lines cross, the paints mix to form the appropriate colour, just like real paints. In fact, its behaviour is so natural that one rapidly forgets that this is electronic, and not real paint; except that here there is no mess and no risk.

Quantel's Paint Box has been designed for this natural look. It provides all the tints, tones and brightness levels observed in any real painting or camera scene. Equally, on the text generation side, a wide range of crisp, beautiful fonts is provided, which are quite unlike the harsh typography typical of simple electronic character generators.

Unmatched versatility

As the artist works with his brush, so he controls the Paint Box with its stylus and touch tablet - its position on the screen canvas being shown by a cursor. A stroke sideways off the tablet brings up the menu of artists' facilities, while a vertical stroke replaces this with the artist's palette, on screen.

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Facilities provided include painting, graphics, text, cut and paste and stencil operations, as well as the picture library. Selecting a particular mode is achieved simply by touching the appropriate title on the menu, with the stylus.

When in Painting, the Paint Box provides a range of brush sizes and paint types from oils to chalk, and even to air brush, to match almost every painting style. When in Graphics, it is quick and easy to draw everything from straight lines to ellipses - filled or outlined. And the results are always displayed first, before being fixed over the background so that trial and error is simple.

Equally, when going to electronic Cut and Paste, nothing need be permanent - any number of different positions, sizes, orientations and colours can be tried, until the desired effect is achieved. Using the Air brush, these shapes can also be given soft edges allowing, for example, the outline of a cloud or a person's hair to be brought cleanly out of a picture. Similarly, in Stencil, any shape can be created and filled with paint, graphics, text or existing library images.

On Quantel's Paint Box any of these facilities can be combined with any other, allowing the artist to create exactly the picture combination or effect he wants. The artist is further aided by the integral library, which provides storage for pictures, parts of pictures, stencils and cut-outs, thus enabling him to construct any composite from stored images.

#### A live graphics studio

Quantel's Paint Box will accept live video inputs either in composite form or in RGB and this, too, can be frozen to form the basis of artwork. The Paint Box can also be integrated into the TV system and can easily transfer pictures to the Quantel Digital Library System, without degradation, via a digital link. Additionally, it has a video output for live transmission to a vision mixer. The Paint Box thus has full, live TV graphics studio capability.

So, whether the need is for a montage of people, places, graphics and text for an imminent news story, or an original oil painting with beautiful hand drawn text for a trailer; illustrative graphics for education, or interesting animation for visual aids; the Paint Box provides the key to excellence and speed.

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A master stroke for fine art - Quantel's Paint Box

On selecting Paint, the artist enters a world of creative art previously impossible direct on the TV screen. Not only is the painting quality of the system unrivalled, but its versatility of style simply has no equal.

Choices include oil paints, water colours, chalk and air brush, all provided to achieve limitless moods. And all these styles are also available for use with graphics, cut-outs, stencils and characters. Quantel's Paint Box also provides five brush sizes for each style of painting and the artist interacts with these tools and his range of mediums via the touch tablet and stylus.

In the Paint mode, the stylus lays paint exactly as does a brush with traditional oils. Strokes with the stylus on the touch tablet are every bit as fluid as its brush counterpart; paint appearing on the canvas is denser where applied heavily and trails off as the pressure is relaxed. Paints mix when applied thinly, but as the pressure is increased, the newly deposited paint becomes opaque - just as one would expect with normal painting.

Quantel's Wash mode provides another style of painting which is similar to conventional water colours. Paint laid down always remains translucent so that underlying detail is never quite lost. Using this mode, an artist can also deposit a completely smooth wash of any tone over the full canvas to provide a perfect background for 'water colour' painting, graphics and text.

The converse of this is Shade, where the tonal range is controlled. This lends itself to tinting and shading details already drawn on the canvas, say, in the normal Paint mode. A fourth painting mode, called Chalk, is designed to add texture to the brushed colour. Results are similar to those achieved using chalks or crayons. Painting in this style gives the superb depth characteristic of the medium.

Next is Quantel's Air Brush mode, which is as easy to use as the 'water colours', 'crayons' and 'oil paints'. This, too, matches the conventional tools used in the studio, providing that perfect softness of transition between the various tones, in a manner only possible with this technique.

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Another important facility is the Magnification capability which allows the artist to treat the TV screen as an expandable canvas - he can pick any area and magnify it to twice full size. This is particularly useful for detailed, close work.

A stroke of the stylus downwards off the Paint Box touch tablet brings up the artist's palette in the lower portion of the canvas. This features 35 pre-selected colour pots chosen by the artist from a large colour bank, or it can be a palette complete with mixed colours, from a library file. Any of the pots may be filled with any paint mixture. The palette also provides a mixing area, a brush size selection panel and a bar indicator displaying the precise colour selected.

Using the stylus, paints can be mixed simply by brushing together colours selected from the pots or from the mixing area. If the particular tone required is found between several colour strokes, it can be picked up simply by dabbing the stylus literally into the mixed paint at that precise point.

Choosing a colour does not stop at the palette. Colours can also be selected 'directly' off the picture, via the tablet. Indeed, as an artist progresses with a painting or graphic, the palette will be needed less frequently since paints can be mixed on the picture itself. A touch on the picture thus provides an exact match, instantly, for progressing with any part of a painting. Besides dramatically speeding up the creative process, this facility is also particularly useful for retouching work - whether from frozen video, paintings, graphics or photographs.

#### A retoucher's dream - Quantel's Paint Box

Since the Paint Box can accept video feeds, the artist is free to capture and freeze any live TV image. From this point on, the picture behaves like any other created on the Paint Box. So, applying any of the range of brushes, the artist can then retouch the picture, using existing screen colours for a perfect match, modify it using the palette if necessary, or augment it with graphics, text of any kind, or even portions of other pictures. Further, using the live video feed unfrozen, and mixing with frozen video, or painted or graphic pictures, results in superb composites previously only possible in the film studio.

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With Quantel's Paint Box, TV pictures can now be retouched or modified in any of these ways without resorting to photographic processes. And, with the sheer quality of images constructed on the Paint Box, artists can now undertake work that would have been virtually impossible by other means - and do it very rapidly.

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Superb graphics design - Quantel's Paint Box

Selecting Graphics brings the power of Quantel's Paint Box to the graphics designer. Facilities provided include comprehensive help with drawing separate or connected straight lines, rectangles, circles and ellipses, simply by touching the appropriate title on the menu.

The graphics artist can easily position and size these freehand anywhere on the screen, using the stylus, or can ask the Paint Box to ensure that all lines drawn are horizontal or vertical only. Further, he can define a grid of any size, and the Paint Box then fits graphics accordingly - displaying the result, as always, before the artist need fix it in position.

Line width can be selected from the brushes on the painting palette. Additionally, colours can be mixed and used with all the facilities provided in the Paint mode.

When drawing straight lines, the artist first presses his stylus down on the touch tablet to fix one end. The Paint Box then provides an elastic line (of the colour, texture and width selected) seemingly attached to the stylus tip, which the artist can move around the picture, at will. The other end is fixed simply by again pressing the stylus on to the touch tablet.

Drawing rectangles, circles and ellipses is equally easy, the stylus being used to define opposite corners of the box containing the shape. Here, the Paint Box shows the graphic box as an apparently elastic figure, moving wherever the stylus travels, until fixed by the artist.

Shapes created can be filled automatically with any colour and constrained to any grid chosen by the artist. And all graphics are produced to the high quality embodied in the fine art painting aspects of the Paint Box, courtesy of Quantel.

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Since all modes can be combined, the scope for creating original images in the broadcast TV world is <sup>enormous</sup> impressive. Topical and unusual graphics composites can be drawn quickly and easily to illustrate, for example, news, financial results, employment trends and statistics. Thus, here too, Quantel's Paint Box is the ideal creative tool for the rapid generation of imaginative graphics.

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Perfect text generation - Quantel's Paint Box

For titling pictures and graphics of any kind, Quantel's Paint Box includes a comprehensive Text mode. This comprises a wide range of professional fonts of the highest quality and in an infinite variety of sizes. Again, the full spectrum of Paint mode colours and facilities is available.

Fonts can be selected by name or browsed from the library and may be typed out in several ways. A separate, physical keyboard is provided and the Text menu also displays a mimic keyboard in the lower part of the screen, together with a message and text area.

The artist can create text using the conventional keyboard or the stylus with its screen keyboard. As he proceeds, the string of characters will appear in the message area on the menu, and can then be taken as a whole and positioned, using the stylus. Here, proportional character spacing, including even kerning, is automatic.

Alternatively, the artist can take each character from the menu keyboard and position it individually on the canvas, rather like rub-on lettering, the stylus tip holding the letter on-screen until it is stuck down. Here character spacing is entirely at the discretion of the artist.

Quantel's Paint Box also provides a comprehensive range of editing facilities for type setting.

Having positioned the text, the artist can create effects such as drop shadow and blind embossing automatically, or manually, using any colour. Many more special characters and artists' techniques can be developed and at all times, artwork is of the high professional standard set by Quantel's fine art.

Thus, using the Paint Box, news, trailers, credits, sports results and the whole range of TV broadcast pictures, can have text of any kind, and logo types, added both cleanly and very rapidly, without the need for laborious conventional artwork preparation.

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Cut and paste at its best - Quantel's Paint Box

In Cut and Paste, Quantel has taken all the picture creativity so far embodied in the Paint Box, and added a major facility - electronic scissors and paste. Since this feature is electronic, rather than physical, pictures of any kind can be cut, re-sized, moved around and fused in any way, very rapidly and with excellent results.

Pictures stored in the Paint Box library, whether paintings, graphics, or combinations of both, as well as frozen video, can be taken by the artist and any part 'cut' away to form a cut-out. The cut-out is created simply by drawing around the area of interest. But, unlike ordinary scissors, the electronic version can cut an edge as hard or soft as required. Selecting the air brush, for example, results in a mixing of the cut-out edge area with the background, so that aircraft propellers... create a semi-transparent swirl, and hair detail on a portrait can have a natural, soft edge.

The quality of the Paint Box cut-out is, of course, identical to the original video, being an exact copy lifted from it, and its shape can be as simple or complex as required. Once defined, the cut-out image itself can be picked up and moved around the canvas at will, in real time, affectively staying on the end of the stylus. If desired, its mirror image can also be created instantaneously. In this way, the artist is able to position the image and to see exactly the effect he is creating, before 'tacking' it to the picture, with a press of the stylus.

caption  
Additionally, by using the separate joystick provided, the cut-out can be re-sized, and rotated to any desired angle in much the same way as is achieved using a rostrum camera, but live, directly on screen. Once the artist is happy with his cuts, he can confirm the pasting of his cut-out to the background simply by touching the stylus to the 'stick' command on the menu. The cut-out is then blended permanently into the background with an accuracy better than can be achieved using flat artwork and without the associated problems.

Any picture can be used as a background over which the cut-out can be moved to create new pictures or combinations of graphics, frozen video, paintings and text. Quantel has thus unleashed the graphic artist's creativity and dramatically enhanced his speed of assembling, for example, complex composites from a whole range of stored and re-sized images.

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*enter the world of animation*

Electronic stencils for unbeatable TV art - Quantel's Paint Box

A further novel facility is the Paint Box's ability to treat any cut-out shape, whether hard or soft edged, as an electronic Stencil. Once created, a stencil can be used as drawn, or as its converse. And if the artist selects the air brush option, the Paint Box becomes the exact electronic equivalent of a mask and spray gun.

Of course, the scope of this mode widens considerably if the artist chooses to use it in conjunction with the full range of painting, graphics and text modes. It widens again if he calls up an existing picture from the built-in library, using this as the new background for stencil work.

Further, since the picture beneath the electronic stencil itself remains unchanged, it is a simple matter to create magnificent three dimensional effects with both foreground and background. Employing the cut and paste routine again, in this case, also allows the artist to animate a picture, the Paint Box providing the complete creative tool to free his imagination.

In fact, Quantel's Paint Box, opens the door to a whole world of animation effects. It's perfect colour matching promotes superb cell animation. But it's sheer power also provides marvellous computer-assisted animation, allowing, for example, oil barrels on a graphic to grow, ships to sail, and our squirrel to stroll through the woods munching nuts! Naturally, the artist is also always free to produce frame-by-frame animation directly on the Paint Box.

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1152Complete picture library - Quantel's Paint Box

Since the graphic artist normally needs to access a number of different pictures during his work, Quantel has included a picture Library with the Paint Box to provide a fund of pictures. This comprises a Winchester disc drive, which is able to store a combination of some 200 pictures, parts of pictures, stencils, cut-outs and artists' palettes. Pictures can also be transferred to floppy disc, on a one picture per disc basis, for longer term storage. Being digital pictures, these are recalled to the screen in perfect condition.

Selecting the library mode brings up the appropriate menu with its Browse 'key', keyboard and message area. Using the stylus, the artist can touch the browse key to view the contents of the library in groups of 12 pictures. At any time he can touch a picture of his choice, via the tablet, to call it up to full screen size. Alternatively, he can search by title and the Paint Box then provides a list of pictures, whose titles include the key word entered. The artist simply touches the relevant title to obtain that picture.

As soon as the picture appears on the canvas it is ready to be worked on by the artist. Having progressed with the picture or made some alterations or another composite, the new picture can itself be saved away to another library file. On Quantel's Paint Box, pictures can be saved at any time, giving the artist confidence to try several effects without the worry of destroying valuable original work.

The Paint Box library can be extended by adding Quantel's DLS 6001 Digital Library System, either connected directly to the Paint Box via a digital link or by video input. This also provides full, on-air presentation facilities.

Quantel Limited adheres to a policy of continual product advancement and reserves the right to alter specifications without notice.

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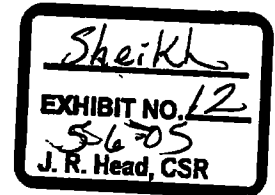
Micro Consultants, Inc., P.O. Box 50810, Palo Alto, California 94303, Phone (415) 856-6226, Telex 334420

March 22, 1982

## NEWS

### PRELIMINARY DESCRIPTION

#### The Quantel DPB 7000 Digital Paint Box



#### Introduction

Claims of 'breakthrough' and 'revolutionary approach' abound in the broadcast equipment industry, but when Quantel unveiled the DPB 7000 Digital Paint Box at NAB 1981, it was universally agreed that the machine did indeed represent a revolutionary approach to the electronic generation of graphics, and, in terms of the fidelity of the images produced was a genuine breakthrough.

#### The Paint Box - A Complete Graphics Studio

The Paint Box is a multifaceted tool able to fulfill all the requirements of the graphics studio: creating fine art free-hand drawing of quite breathtaking fidelity; retouching real video pictures; offering standard graphic routines for 'painting by numbers'; providing superb quality fonts for character generation; containing its own library of pictures; allowing composition of graphics by the assembly of several different pictures; graphic primitives; repositioning, re-sizing and re-orientating those pictures; producing soft blending of images; building stencils; and allowing animation of portions of the pictures.

In fact the Paint Box does indeed offer all the tools normally found in a complete Graphics Studio in one machine.

#### The Paint Box - A Fine Art Device

Apart from the absence of a large computer, at first sight the DPB 7000 paint box hardware appears just like a first-generation paint system. There is a touch tablet on which to draw with a stylus, a screen to observe the results, a small box of electronics doing the work, and a Winchester disk storing a library of pictures.

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When an artist starts to use the system, the differences between the Paint Box and first-generation equipment become quickly apparent. As he draws, the lines created are completely smooth, even those lying close to the horizontal. The familiar 'serrated' electronic lines are not visible - even in the seemingly impossible area of where lines of different colors overlap. All this is achieved with an image that is beautifully sharp and applies whatever saturation, hue and luminance level is used. The deceptively simple task of signing a name on the screen is so smooth and the realism so great, that the results are quite disarming.

However, perhaps the most striking operational difference with the Paint Box is that the stylus has 'feel' - it is pressure-sensitive. In a manner similar to a pencil, the harder the pressure on the stylus, the bolder the stroke; the lighter the pressure, the more delicate the shading. Areas covered several times with light pressure become progressively bolder - again, just like a pencil. Also, when painting, overlapping colors mix - just like oil or water color.

All functions of the Paint Box are controlled from the touch tablet. A stroke of the stylus sideways off the tablet brings up a selection menu. If painting is selected, a stroke down off the tablet with the stylus will bring up the palette. The palette consists of 20 preselect colors selected from a color bank at the start of a session, 12 empty paint pots which the artist can fill as he goes along, a color mixing area, a selection of four brush sizes and a type of brush selection.

The 20 or so basic colors on the palette are not sufficient for a full painting, so the artist has been provided with a means of mixing colors. If he dabs color onto the central area of the palette (the mixing area) then selects another color and applies a thin layer of that across the first color, the two will mix. The artist can then touch his stylus in the area where the two colors have mixed and pick up the mixed color. He can then paint with this color, or he may again apply it to the palette and mix it with another color, select the new mixture, and proceed to paint with that new color. In fact, there is no limit to the different colors which the artist may mix from the basic set. This method of color mixing applies to all brush sizes. Having mixed up a color which he likes, the artist may then put this into one of the empty paint pots for later use.

As well as being able to pick up colors mixed on the palette, the artist can also select colors from the picture itself. As the picture progresses, it becomes easier to pick up a color from the picture, perhaps modify it with some white or black to change its shade, and then continue painting in detail with this new color, while the paint pots are used less and less.

There are three modes of painting available on the system. The first operates like normal paint, in that it mixes with the base color when applied thinly and becomes completely opaque when applied thickly. The second is a form of water color. This can still be applied in a thick or thin film that always remains translucent, so that the

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underlying detail is not lost. It is used for laying down transparent washes of color, either as a background, or for tinting and shading detail already drawn. The third mode adds texture to the brush in much the same way as chalk, allowing the artist to easily achieve a slightly textured effect on paintings.

The artist has on the palette all the basic tools needed to do a painting and can access them very simply. This allows him to concentrate on painting without having to think how he actually sets about operating the system. Actually, the Paint Box behaves in exactly the same way as all the elements that the artist is used to. The exercise of painting or drawing, is really very unsurprising once having overcome the initial shock that it is all done electronically, and is not wet and sticky. This total cleanliness and ease of precisely matching colors by being able to pick them up directly from the painting, increases the speed of painting considerably.

A section enlargement facility allows any area of the picture to be magnified to twice its size so that the artist can work in much greater detail on particular parts of the picture if he so wishes.

#### The Paint Box - A Retoucher's Dream

Because the Paint Box operates as a full color machine with the entire scope of the NTSC system available, it is able, in real time, to accept any RGB or NTSC video feed. The artist may freeze the image at any time and then retouch it, modify it, or augment it with graphics at will.

Since the Paint Box allows colors to be picked off the canvas as well as the palette, retouching is a dream: perfect color match occurs automatically by picking up color directly from areas adjacent to the one to be retouched.

Now, with the Paint Box, video can be retouched or modified directly without resort to the photographic process, and the quality of the resultant image allows the artist to undertake work that would be virtually impossible in the photographic medium.

#### The Paint Box - An Automatic Graphics Designer

A full automatic graphics package is included in the Paint Box. Simple routines allow straight lines, circles, ellipses, boxes, etc., to be drawn automatically and placed free-hand or against an invisible grid. With the addition of automatic color fill routines and a smooth air brush, all the normal day-to-day graphic aids an artist would want to use for the generation of TV graphics are at his fingertips.

#### The Paint Box - A Superb Character Generator

Good pictures and graphics are of little use unless top quality fonts are available for adding text.

The Paint Box has built into the library of routines available very high quality fonts with characters that can only be compared against the

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finest of studio cameras viewing the best artwork.

Text may be generated in either of two ways depending on the artist's preference. Having chosen the font, he may position each character individually by means of the touch tablet (like lettraset); or he may type a string of characters using the keyboard and then position this whole string with the stylus. In the former case, character spacing is entirely at the discretion of the artist; in the latter case, proportional spacing is automatic.

Many different fonts are available with the full range of colors and with or without drop shadow.

#### The Paint Box - A Picture Library

During a normal working day the artist will have many pictures to which he may wish to refer.

The Paint Box includes a Winchester disk able to hold 300 pictures or parts of pictures. To support this facility the system has full titling and title search by keyboard. The images themselves may be browsed through against a title keyboard, 12 at a time, to remind the artist of the contents of the disk. When he finds a picture he wants he merely touches it via the stylus and touch tablet and it appears full-size ready to be worked on.

In addition to the internal library, the Paint Box can be augmented by the DLS 6000 digital library system. The DLS 6000 can be connected directly to the Paint Box via a digital link, or connected via the tape back-up system for the 6000 carrying pictures on an ordinary U-Matic cassette but in slow digital format.

Also floppy disk storage is available on a one-picture-per-disk basis.

#### The Paint Box - A Perfect Picture Assembly Aid - Cut-and-Paste

The Paint Box has a unique facility of being able to join or fuse pictures together.

The artist is able to take images he has drawn free-hand or created using the graphic routines and create a mask or key by simply drawing around the part of the picture of interest. The quality of the mask drawn with the same brushes used for painting is as good as the original video. The shape of the mask can be as complex or as simple as desired. The smoothness of the edge will be the same as the original drawing.

Once the mask has been defined, the artist can pick up the cut image with the touch tablet stylus and move it around at will - actually seeing the image move in real time.

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If a different background picture is called up from the Paint Box library, then the cut image can act as foreground and move over the background just as if the cut image were against a chroma key area and keyed into the background in a switcher.

However, the magic of the Paint Box does not stop at just being able to move the cut video around. By means of a small joystick the artist is also able to change the size and aspect ratio of the cut image and rotate it.

In other words, it is as if the cut image is on a rostrum camera and the artist is able to reposition and re-orientate the artwork as well as play with the zoom lens. However, there is no camera, no zoom lens, and no artwork to curl up or get dirty.

Once the artist is happy that the position, size and orientation of the cut image is correct, he confirms that the two images are to be pasted (or fused) together. The cut image is then blended permanently into the background using the mask or key information.

Consider the preparation of standard television graphic, say a news item on the State of the Union Message. The artist could draw a free-hand sketch of the Capitol full size. He could also have in the library a real video picture of the President.

To compose the graphic he would choose a background color and the Paint Box will automatically flood the screen in this color. He then calls up the Capitol, draws around the outline he wishes to use (probably in this case with a broad soft brush to achieve a soft edge). He can reduce the size of the image, move it to a point that he likes, choose the correct orientation, and then tell the Paint Box to paste it into the background.

Next he does the same thing with the real picture of the President, noting that since the President is pasted last he can overlap the Capitol if required.

Finally, a font for the caption 'State of the Union' is chosen and the letters either pasted individually or as a complete string. The complete graphic can then be returned to the internal Paint Box library or sent to the DLS 6000 library system for on-air transmission.

An exotic use of the cut-and-paste routine is to accentuate the soft-edge mode to the point where the mask or key is not hard or solid at all. This will cause a mixing of the foreground object and the background instead of the 'fusion' described earlier.

An example of such a technique is the representation of a propeller on an airplane normally shown as semi-transparent swirls to indicate motion. Utilizing the soft key approach, the airplane itself can be cut as usual but the propeller swirls can be cut with a soft key. The resultant image when pasted up will show the airplane replacing the background. However,

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the background behind the propellers will still be visible through the swirls.

The Paint Box - An Electronic Stencil

A slightly unusual application of the mask, normally used for cut-and-paste is to utilize the mask as a stencil. Coupled with the air brush routine, the results are remarkable: the exact electronic equivalent of a stencil and spray gun.

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**THE UNITED STATES OF AMERICA****TO ALL TO WHOM THESE PRESENTS SHALL COME:****UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office**

May 07, 2004

**THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM  
THE RECORDS OF THIS OFFICE OF:****U.S. PATENT: 4,821,121****ISSUE DATE: April 11, 1989****By Authority of the  
COMMISSIONER OF PATENTS AND TRADEMARKS****T. LAWRENCE  
Certifying Officer**

## United States Patent [19]

## Beaulier

**[11] Patent Number: 4,821,121**

[45] Date of Patent: Apr. 11, 1989

**[54] ELECTRONIC STILL STORE WITH HIGH SPEED SORTING AND METHOD OF OPERATION**

[75] Inventor: Daniel A. Beaulier, Menlo Park,  
Calif.

[73] Assignee: Ampex Corporation, Redwood City,  
Calif.

[21] Appl. No.: 18,786

**[22] Filed: Feb. 24, 1987**

### Related U.S. Application Data

[63] Continuation of Ser. No. 740,297, May 31, 1985, abandoned, which is a continuation of Ser. No. 483,327, Apr. 8, 1983, abandoned.

[51] Int. CL<sup>4</sup> ..... H04N 5/14

[52] U.S. CL. 358/160; 358/183

[58] Field of Search ..... 358/160, 183, 311, 342,  
358/102; 360/35.1, 9.1, 10.1, 14.1

## [56] References Cited

## U.S. PATENT DOCUMENTS

4,152,722 5/1979 Inuiya et al. .... 358/102

4,172,264 10/1979 Taylor et al. 358/185

4,302,776 11/1981 Taylor et al ..... 358/160

## FOREIGN PATENT DOCUMENTS

0051305 5/1982 European Pat. Off. 360/14.1

## OTHER PUBLICATIONS

**Hugh Boyd, "The DLS6000—A New Digital Still Store Library System", International Broadcast Engineer, vol. 11, No. 170, pp. 46-48.**

**Primary Examiner—Edward L. Coles, Sr.**

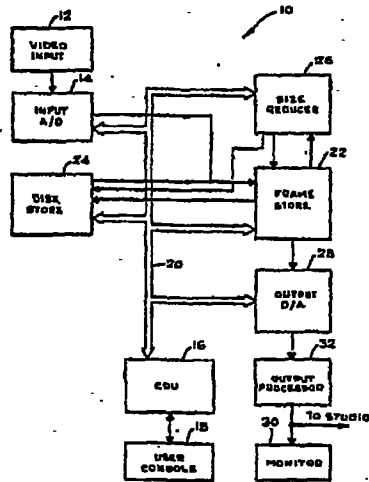
**Assistant Examiner—David E. Harvey**

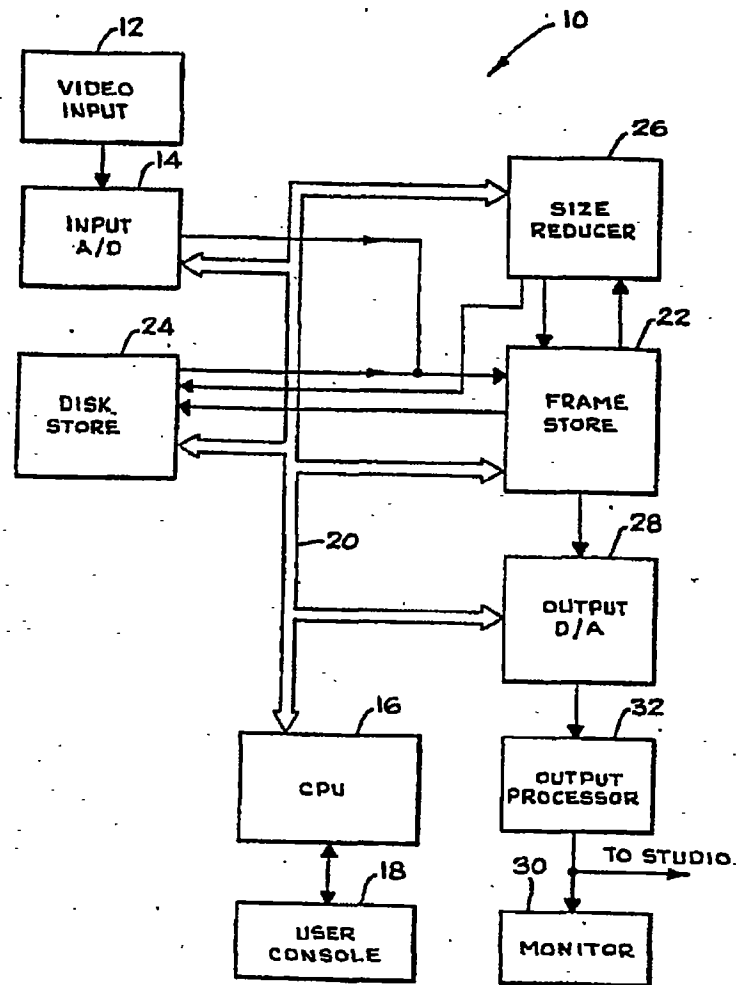
**Attorney, Agent, or Firm—Bradley A. Perkins; Ronald C. Fish; George B. Almeida**

## [57] ABSTRACT

An electronic still store system stores and selectively outputs video image data defining a plurality of signal frame still images. The simultaneous display of up to 16 or more quarter sized images for scanning or sorting by an operator is facilitated by generating a quarter sized copy of each newly received image frame and storing both together on a conventional magnetic disk storage device as is typically employed in general purpose digital computing systems. The quarter sized image can then be recalled directly for a multi-image scan or sort function in which 16 reduced size images are displayed simultaneously without the time delays associated with the retrieval and size reduction of 16 full size images.

**. 15 Claims, 1 Drawing Sheet**





# ELECTRONIC STILL STORE WITH HIGH SPEED SORTING AND METHOD OF OPERATION

This is a continuation of application Ser. No. 740,297, filed on May 31, 1985, now abandoned, which is a continuation of application Ser. No. 483,327, filed Apr. 8, 1983, now abandoned.

## BACKGROUND OF THE INVENTION

This invention relates to a digital electronic still store for broadcast television signals and more particularly to a still store providing a high speed multiimage scan or sort capability.

Digital electronic still store video display systems store a plurality of frames of video images on relatively low cost magnetic disk storage. Any selected one of the stored image frames may then be communicated to a frame store from which data defining the image is repetitively read out to generate a continuously displayed television image. The still store image can then be combined with a second image to create a combined video image. For example, it is common to insert a selected still store image depicting a news event in the upper left hand corner of a live studio image depicting a newscaster describing the news event.

The disk store is capable of storing a large library of single frame images and it is often desirable to generate a reduced size multiple image picture for editing or other purposes. For example, it might be desirable to create a special effect with multiple images or an editor may wish to view and compare several images at the same time for the purpose of selecting those images which will be used in a television broadcast. However, each of the several images which are to be simultaneously displayed must first be read from the disk store as full size images and then reduced for insertion into the multi-image display. This process takes  $\frac{1}{2}$  to  $\frac{1}{4}$  second for each image and results in a delay of several seconds for the composite multi-image display. Such a time delay is at best disconcerting for a busy editor and precludes use of the editing features of the system during a real time broadcast.

U.S. Pat. No. 4,172,264, "Control Arrangement for Video Synchronizers", to Taylor et al describes an arrangement in which joysticks may be used to selectively position video images on a television display. The system requires full sized images to be accessed and then reduced in size as described above.

U.S. Pat. No. 4,302,776, "Digital Still Picture Storage System With Size Change Facility", to Taylor et al discloses a still store system in which multiple images may be accessed and reduced in size for simultaneous display as discussed above. The suggestion is made that an array of reduced size images be stored as a single image frame. This has the effect of eliminating the time required to reproduce the array but precludes the flexibility of choosing or repositioning any desired images when recalling the array. Furthermore, the aforementioned time delays are encountered when assembling the original multi-image display.

## SUMMARY OF THE INVENTION

An electronic still store system in accordance with the invention rapidly generates and outputs for display to an operator a still image frame comprising a plurality of selectively positioned, reduce size images which may be simultaneously viewed for scanning or editing pur-

poses. The system includes an image store for storing therein a plurality of frames of video images with both a full spatial resolution copy for full size video output and a reduced spatial resolution copy for reduced size video output of each image being stored, and a frame store which is operable in a first mode to receive from the image store, store and repetitively generate a full spatial resolution output image frame. The frame store is operable in a second mode to receive from the image store and store a plurality of reduced spatial resolution image frames. The frame store is further operable in the second mode to repetitively generate an output image frame having an image from each of the plurality of reduced spatial resolution image frames selectively located at a different position within the output image frame.

The system may further include an image size reducer coupled to produce a quarter size reduced spatial resolution image in response to a full resolution image stored by the frame store, a video input, an analog-to-digital converter coupling the video input to the frame store, a monitor for viewing output video images and an output digital-to-analog converter coupled to convert the output video images from a digital form to an analog form for use by the monitor. A central processing unit is connected to receive user commands through a user console and to control the other devices of the system in response thereto.

The image store employed herein is a general purpose magnetic disk storage system as is currently used in general purpose digital computer systems.

In operation the system can rapidly assemble an array of 16 reduced size images for output as a single image frame. A system operator may view the reduced size images simultaneously for rapid scanning of some or all of the stored images within the image store, which is preferably a magnetic disk. Because the images are read from the image store in reduced size and spatial resolution, the output image formation time is approximately the  $\frac{1}{2}$  to  $\frac{1}{4}$  second required to transfer a single full size image instead of the several seconds which would be required to transfer 16 full size images prior to resolution reduction and storage as a reduced size image.

Using this system an operator may rapidly scan many still frame images which are stored by the image store or may compile lists of randomly selected image frames for simultaneous viewing as an array of reduced size images. Because of the rapid response rate the system becomes feasible for development and outputting of data frames containing multiple reduced size images on demand during a television broadcast.

## BRIEF DESCRIPTION OF THE DRAWING

A better understanding of the invention may be had from a consideration of the following detailed description taken in conjunction with the accompanying drawing in which the sole FIGURE is a block diagram representation of an electronic still store system in accordance with the invention.

## DETAILED DESCRIPTION

Referring now to the sole FIGURE, a digital electronic still store system 10 for rapidly assembling as a single image frame an array of reduced size images is shown as including a video input circuit 12. The video input circuit 12 may be another electronic still store system, a TV camera, or some other source of video data from which one or more frames of a video image

may be captured. In the preferred embodiment of the electronic still store system 10, the video signal is processed in component form. A method and apparatus for producing the component information which may be employed is more fully disclosed in the U.S. Pat. No. 4,675,876, issued Sept. 22, 1987 to D. Beaulier, which is assigned to the same assignee as this application, which is incorporated by reference herein. Therefore, the video input 12 will include appropriate video signal decoding means to process video data received from sources that provide the data in an encoded form.

An input analog-to-digital (A-D) converter 14 is coupled to receive an input video signal provided by the video input circuit 12, which typically includes video signal processing circuitry that prepares the signal for conversion by the A-D converter 14. The A-D converter 14 converts the input video signal to a digital form which is suitable for handling and processing by digital circuitry. The input AD 14 receives the video signal from the video input 12 and converts the video signal to the digital sampled data form in which each pixel of video data is represented by three eight bit data bytes defining respectively luminance, red chrominance and blue chrominance components. Conventionally, the chrominance data has half the spatial resolution of the luminance data in the horizontal dimension so that data is produced in a repetitive 4 byte luminance/chrominance component sequence of L1, CR1, CB1, L2—L3, CR3, CB3, L4 and so forth. The single byte representation affords a high dynamic resolution of 256 distinguishable states for each color component. For adequate dynamic resolution, each video component at a sampled data point is preferably defined by at least 6 binary bits providing 64 distinguishable intensities. A central processing unit (CPU) 16 formed from a Z80 microprocessor is connected to receive operator commands from a user console 18. CPU 16 is connected for bidirection communication of commands and other data over a system bus 20. The system bus 20 is connected to input A-D 14 as well as other major components of the still store system 10 to carry the address, mode select and status information required to control the operation of the still store system 10.

A frame store 22 which in the preferred embodiment is a random access memory, is coupled to receive mode control information from CPU 16 over system bus 20 and to receive video data representing a frame of a video image from either input A-D 14 or from a multiple frame image store implemented as a magnetic disk drive store 24 in the preferred embodiment but which can be any bulk storage memory device in other embodiments. Frame store 22 is a random access store that is capable of storing more data than is required for a single video image frame.

The storage capacity provided by presently available 64K memory chips enables storing up to 750 lines of video data. In any event, out of a 525 line NTSC frame of data only about 484 lines represent video data. Because of the two dimensional nature of a video image a quarter size image defined by video data having one-fourth the spatial resolution of a full size image requires one-sixteenth the storage capacity of a full size, full spatial resolution image. A quarter resolution image thus requires the equivalent storage of 30 lines of a full resolution image. In any event the frame store 22 either contains initially or is expanded to contain, storage of video data representing a full resolution full size image, as well as a quarter resolution copy thereof.

A size reducer 26 is connected to be controlled by data from CPU 16 received over the system bus 20. Size reducer 26 is operable to receive video data from frame store 22 to convert the video data to a quarter spatial resolution copy thereof, and communicate the quarter resolution copy back to frame store 22 for storage therein. In a similar fashion, when video data received from disk store 24 does not contain a corresponding quarter spatial resolution copy, size reducer 26 may be employed to generate a quarter spatial resolution copy for subsequent transfer to either frame store 22 or disk store 24. Hence, any time frame store 22 receives a video image frame that does not have a corresponding quarter resolution copy, the size reducer 26 may be used to make such a copy.

As a new frame of video data is transferred from frame store 22 to disk store 24 for more permanent storage, both the full resolution and the quarter resolution copy are transferred. Since the quarter resolution copy is represented by only one-sixteenth the data of a full resolution copy, the communication and storage of the quarter resolution copy imposes only a small burden on both system operating time and extra storage space requirement within disk store 24. It should be noted that disk store 24 is a general purpose magnetic disk storage device as is commonly used in connection with general purpose digital computing systems.

During system 10 operation frame store 22 repetitively accesses stored video data to generate a continuous stream of output video data frames representing the stored image. An output digital-to-analog converter 28 receives this digital output data and converts it to an analog video signal which is subsequently supplied to output processor 32. Output processor 32 is a conventional video signal output processor, for forming a television signal in a standard format, which can be used to drive a monitor 30 for viewing of the output video image by a system monitor. The analog video signal form may also be communicated to studio equipment for further use, broadcasting or storage.

When operating in a first, normal broadcast mode, frame store 22 receives a full resolution frame of video data from disk store 24 and outputs a continuous television image in digital data form in response thereto.

In a second, editing or browsing mode, CPU 16 commands disk store 24 to output reduced resolution image data which is selectively positioned in frame store 22 for viewing in one of 16 reduced size image positions in a 4x4 array as a mosaic which fits within a normal full size image. Under operator control, the 16 viewable images may be taken sequentially from disk store 24 starting with a selected image frame. This mode is useful when scanning all of the images stored by disk store 24. Alternatively, the 16 images may be taken randomly from a list of stored images developed by the operator. This mode is especially useful when it is desired to compare certain images.

The 16 image assembly time is greatly reduced because only an amount of data equivalent to one full size, full spatial resolution, image need be transferred from disk store 24 to define all 16 images. This is only one-sixteenth of the time that would conventionally be required.

While there has been shown and described above, a particular arrangement of an electronic still store system which can rapidly compose a multiple image frame of data, for the purpose of enabling a person skilled in the art to make and use the invention, it will be appreci-

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ated that the invention is not limited thereto. Accordingly, any modifications, variations or equivalent arrangements within the scope of the attached claims should be considered to be within the scope of the invention.

What is claimed is:

1. An electronic still store system comprising:

an image store means for retrievably storing therein a plurality of image frame copies of video frames, the image frame copies comprising data representing full spatial resolution images and corresponding data representing reduced spatial resolution images of the video frames;

frame store means for receiving and storing in a first mode one of said full spatial resolution images from said image store means and for repetitively generating a full spatial resolution image output, and in a second mode for receiving from the image store means and storing a plurality of said reduced spatial resolution images each at selectively located different positions, the frame store means in the second mode further repetitively generating an image output comprising the stored plurality of said reduced spatial resolution images; and

size reducer means for receiving from the frame store means the stored full spatial resolution image and in response thereto returning to the frame store means a corresponding reduced spatial resolution image, wherein the frame store means receives and stores the returned reduced spatial resolution image while continuing to store the stored full spatial resolution image.

2. The electronic still store system according to claim 1, wherein the reduced spatial resolution images each have a spatial resolution of one-fourth the spatial resolution of the corresponding full spatial resolution image.

3. The electronic still store system according to claim 1, wherein said frame-store means includes a central processing unit, controlled by an operator in said first mode for selecting which of said full spatial resolution images stored in said image store means is to be retrieved from the image store means, and in said second mode for selecting which of said reduced spatial resolution images stored in said image store means are to be retrieved and stored in said frame store means, and further for selecting the different positions within a video frame at which each of said retrieved reduced spatial resolution images is stored.

4. The electronic still store system according to claim 3, wherein said frame store means further comprises an output digital-to-analog converter coupled to receive output image data from the frame store means and in response thereto to generate an analog video signal representing an output image; and

a monitor coupled to receive the analog video signal and display the output image represented thereby.

5. The electronic still store system according to claim 4, further comprising a video input means for generating an input analog video signal representing an input video image and an analog-to-digital converter coupled between the video input means and the frame store means for converting the input analog video signal to a digital form such that digital data representing said input video image is received and stored by the frame store means.

6. A video still store system comprising:

external source means for supplying a full size image data set representing a full size image frame;

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a size reducer coupled to receive the full size image data set for producing therefrom a reduced size image data set representing a corresponding reduced size image frame;

an image store for storing a plurality of full size image data sets representing a plurality of full size image frames and for storing a plurality of reduced size image data sets representing a plurality of reduced size image frames, each of said reduced size image data sets corresponding to one of said full size image data sets; and

frame store means for storing one of said full size image data sets from either the external source or said image store, wherein if said image store does not supply a corresponding reduced size image data set, said frame store outputs a copy of said full size image data set to said size reducer, and receives in turn a corresponding reduced size image data set;

wherein said image store stores the reduced size image data set along with the previously stored corresponding full size image data set.

7. An apparatus for storing video pixel data representing video images of a first resolution and, for each each of the images at said first resolution, a corresponding video image at a second resolution, comprising:

random access memory means for storing video pixel data representing one of a succession of full size images at said first resolution and a corresponding reduced size version thereof at said second resolution;

bulk memory means for receiving said video pixel data from said random access memory means and for storing said succession of full size images and the corresponding reduced size versions thereof, and for outputting upon a user's command, either a selected one of the successive full size images or selected ones of the corresponding reduced size versions thereof for direct transfer to, and storage back in, said random access memory means; and means responsive to said random access memory means for selectively generating one of said corresponding reduced size versions from the respective full size image in said random access memory means, and for transferring the video pixel data representing and the corresponding reduced size version back to the contents of said random access memory means.

8. An apparatus for storing video pixel data as at least one full size image at a first resolution, and at least one reduced size image thereof at a second lower resolution, comprising:

random access memory means having an input port and an output port, for storing the video pixel data presented at the input port;

said video pixel data representing the full size video image at a first resolution being stored in a first group of memory locations in said random access memory means;

bulk storage memory for also storing the video pixel data and for presenting selected groups of video data at said input port for storage by said random access memory means;

size reducing means responsive to said random access memory means for directly receiving said video pixel data stored in said random access memory means representing said full size image at said first resolution, and for reducing said image to the re-

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duced size image at the second lower resolution, and for supplying said reduced size image at said second resolution directly back to said random access memory means in a second group of memory locations therein;

control means coupled to said random access memory means, to said bulk storage memory and to said size reducing means, for causing said size reducing means to generate said reduced size image at said second resolution and to supply same to said random access memory means in said second group of memory locations; and

said control means further causing the transfer of the full size and reduced size video pixel data from said random access memory means to said bulk storage memory for storage, and for causing the selective transfer from said bulk storage memory directly into said random access memory means of either said full size image at said first resolution or said reduced size image at said second lower resolution.

9. The apparatus of claim 8 wherein said size reducing means produces said reduced size image at said second resolution with one fourth the spatial resolution of said full size image at said first resolution, and wherein said control means determines the transfer of said reduced size image at said second resolution into said random access memory means for storage at a selected one of 16 predetermined groups of said memory locations.

10. A system for storing video data representing video images which are displayable as rasters of vertically distributed horizontal lines, each represented video image normally occupying a raster of selected vertical and horizontal size, the system comprising:

a video image size reducer having an input for receiving video data representing a video image corresponding to the selected raster size and for generating video data representing a reproduction of said video image at a selected fractional-size of said selected raster size;

a first store for receiving video data for storage and for providing video data therefrom, said first store having a capacity for storing the video data representing the video image corresponding to the selected raster size simultaneously together with the video data supplied by said video image size reducer representing said reproduction of the video image at the selected fractional-size;

a second store for receiving and storing the video data stored in the first store and for providing video data therefrom directly to the first store, said second store further storing video data representing a plurality of additional video images each corresponding to the selected raster size, and video data representing a plurality of additional reproductions at the selected fractional size of said selected raster size; and

means for selectively transferring from said second store directly to said first store either video data representing the plurality of video images corresponding to the selected raster size, or video data representing a plurality of reproductions at the selected fractional-size of said selected raster size.

11. A method of storing video pixel data comprising: receiving and storing in selected storage locations in a random access memory, full video pixel data comprising a full size image;

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generating from the full video pixel data, reduced video pixel data representing a reproduction thereof in the form of a reduced size image at a lower resolution;

storing the reduced video pixel data representing the reduced size image in additional storage locations in said random access memory along with the full video pixel data;

storing both the full size image and the reduced size image in bulk storage memory; and

selectively transferring either the full size image or the reduced size image from said bulk storage memory into said random access memory for further processing.

12. A video still store system comprising:

an external source for supplying a plurality of full size image data sets representative of corresponding full size images;

an image store for storing said full size image data sets, and for storing a like plurality of reduced size image data sets representing a plurality of reduced size images, each of said reduced size image data sets corresponding to one of the full size image data sets;

a memory for simultaneous storage of one of said full size image data sets and a corresponding one of said reduced size image data sets;

a size reducer means for receiving from said memory the stored one of said full size image data sets, and for producing and returning to said memory the corresponding one of said reduced size image data sets;

said memory being responsive to either the external source or the image store for storing said one of said full size image data sets, and for supplying to the image store both the stored one of said full size image data sets and the corresponding one of said reduced size image data sets;

said memory being responsive to the image store to store at different selected locations the plurality of reduced size image data sets;

said memory further supplying as an output image either the plurality of reduced size image data sets arranged at different locations within the output image, or the full size image data set; and means responsive to said memory for displaying the output image as a raster scanned video display.

13. A method of storing video pixel data for access and display comprising:

providing data sets for a plurality of full size images at a first spatial resolution;

generating, from the data sets of the full size images, second data sets representing a corresponding plurality of reduced size reproduction images at a second lower spatial resolution;

storing both the data sets of the plurality of full size images and the data sets of the corresponding plurality of reduced size reproduction images in respective selected groups of storage locations; and

selectively accessing from the storage locations a data set representing one of the plurality of full size images, and a data set representing one of the corresponding plurality of the reduced size reproduction images, simultaneously.

14. An apparatus for storing video pixel data as at least one full size image at a first resolution, and at least one reduced size image thereof at a second lower resolution, comprising:

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random access memory means having an input port and an output port, for storing the video pixel data presented at the input port;  
 said video pixel data representing the full size video image at a first resolution being stored in a first group of memory locations in said random access memory means;  
 bulk storage memory for also storing the video pixel data and for presenting selected groups of video data at said input port for storage by said random access memory means;  
 size reducing means responsive to said random access memory means for receiving said video pixel data stored in said random access memory means representing said full size image at said first resolution, and for producing reduced size pixel data representing the reduced size image at the second lower resolution, and for supplying said reduced size image at said second resolution to said random access memory means in a second group of memory locations therein;  
 control means coupled to said random access memory means, to said bulk storage memory and to said size reducing means, for causing said size reducing means to generate said reduced size image at said second resolution and to supply said reduced image to said random access memory means in said second group of memory locations;  
 said control means further causing the transfer of the full size and reduced size video pixel data from said random access memory means to said bulk storage memory for storage, and for causing the selective transfer from said bulk storage memory into said random access memory means of either said full

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size image at said first resolution or said reduced size image at said second lower resolution; and wherein said control means also determines the selective transfer of said reduced size image at said second resolution from said size reducing means into said bulk storage memory via the random access memory means.

15. A method of storing video pixel data for access and display comprising:

providing data sets for a plurality of full size image at a first spatial resolution, wherein each one of the full size images occupies upon display a raster of selected vertical and horizontal size;

generating, from the data sets of the full size images, second data sets representing a corresponding plurality of reduced size reproduction images at a second lower spatial resolution;

storing both the data sets of the plurality of full size images and the data sets of the corresponding plurality of reduced size reproduction images in respective selected groups of storage locations;

selectively accessing from the storage locations a data set of one of the plurality of full size images, and one of the sets of the corresponding plurality of the reduced size reproduction images simultaneously;

wherein the step of accessing further includes, retrieving a plurality of reproduction images, storing the retrieved plurality of images in a random access memory, and outputting the stored plurality of retrieved images as a mosaic of reproduction images occupying a raster of the selected vertical and horizontal size.

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UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 4,821,121  
DATED : April 11, 1989  
INVENTOR(S) : Daniel A. Beaulier

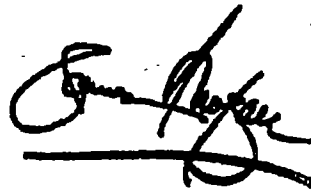
Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

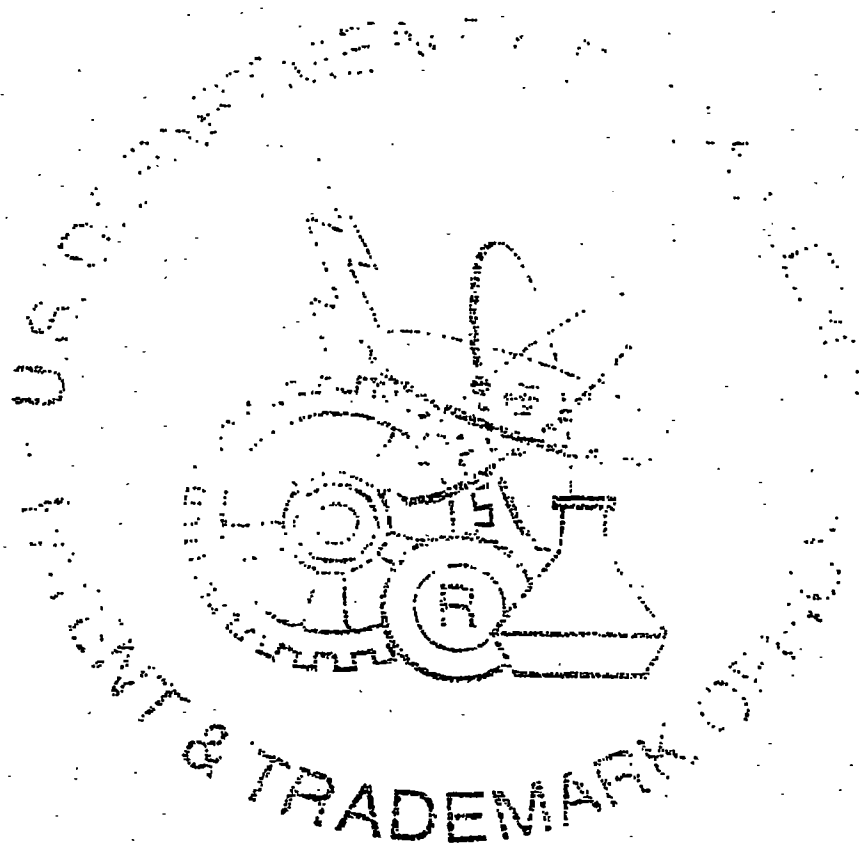
Column 6,  
Line 46, please delete "and"

Column 8,  
Line 61, please delete " ,"

Signed and Sealed this  
Fourth Day of March, 2003



JAMES E. ROGAN  
*Director of the United States Patent and Trademark Office*



UNITED STATES DEPARTMENT OF COMMERCE  
Patent and Trademark OfficeAddress: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
0674837327	04/08/03	BEADLER	D AV-3033

PATENT DEPT.  
AMPEX CORP.  
401 BROADWAY, M.S. 3-35  
REDWOOD CITY, CA 94063

EXAMINER	
HARVEY, D	
ART UNIT	PAPER NUMBER
262	3
DATE MAILED: 12/21/04	

This is a communication from the examiner in charge of your application.  
COMMISSIONER OF PATENTS AND TRADEMARKS

- ☒ This application has been examined ☐ Responsive to communication filed on \_\_\_\_\_ ☐ This action is made final.
- A shortened statutory period for response to this action is set to expire 3 (three) month(s), \_\_\_\_\_ days from the date of this letter. Failure to respond within the period for response will cause the application to become abandoned. 35 U.S.C. 133

## Part I THE FOLLOWING ATTACHMENT(S) ARE PART OF THIS ACTION:

- |   |   |
|---|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited by Examiner, PTO-892. | 2. <input type="checkbox"/> Notice re Patent Drawing, PTO-946.                  |
| 3. <input type="checkbox"/> Notice of Art Cited by Applicant, PTO-1449                  | 4. <input type="checkbox"/> Notice of Informal Patent Application, Form PTO-152 |
| 5. <input type="checkbox"/> Information on How to Effect Drawing Changes, PTO-1474      | 6. <input type="checkbox"/> _____   |

## Part II SUMMARY OF ACTION

1. ☒ Claims 1-14 are pending in the application.  
Of the above, claims \_\_\_\_\_ are withdrawn from consideration.
2. ☐ Claims \_\_\_\_\_ have been cancelled.
3. ☐ Claims \_\_\_\_\_ are allowed.
4. ☒ Claims 1-14 are rejected.
5. ☐ Claims \_\_\_\_\_ are objected to.
6. ☐ Claims \_\_\_\_\_ are subject to restriction or election requirement.
7. ☐ This application has been filed with informal drawings which are acceptable for examination purposes until such time as allowable subject matter is indicated.
8. ☐ Allowable subject matter having been indicated, formal drawings are required in response to this Office action.
9. ☐ The corrected or substitute drawings have been received on \_\_\_\_\_. These drawings are ☐ acceptable; ☐ not acceptable (see explanation).
10. ☐ The ☐ proposed drawing correction and/or the ☐ proposed additional or substitute sheets of drawings, filed on \_\_\_\_\_ has (have) been ☐ approved by the examiner. ☐ disapproved by the examiner (see explanation).
11. ☐ The proposed drawing correction, filed \_\_\_\_\_, has been ☐ approved. ☐ disapproved (see explanation). However, the Patent and Trademark Office no longer makes drawing changes. It is now applicant's responsibility to ensure that the drawings are corrected. Corrections MUST be effected in accordance with the instructions set forth on the attached letter "INFORMATION ON HOW TO EFFECT DRAWING CHANGES", PTO-1474.
12. ☐ Acknowledgment is made of the claim for priority under 35 U.S.C. 119. The certified copy has ☐ been received ☐ not been received  
☐ been filed in parent application, serial no. \_\_\_\_\_; filed on \_\_\_\_\_
13. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.
14. ☐ Other

PTOL-326 (Rev. 7-02)

EXAMINER'S ACTION

AX061587

B-191

Serial No. 483,327

-2-

1. Claims 1-8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention.

The claimed invention deals with the storage, retrieval, and size reduction of still video images. The apparent novelty of the claimed system is that a "stored video frame", corresponding to a given video image, includes a full resolution and a quarter resolution copy of the said video image. This definition of "frame" seems to be made on page 7, lines 7-10, of the disclosure where it is stated, "as a new frame of video data is transferred from the frame store 22 to the disk store 24 for more permanent storage, both the full resolution and quarter resolution copy are transferred." Thus "frame" is interpreted, as described in the disclosure, to define a frame of data which includes both a full and a quarter resolution copy of a given image.

The use of "frames" in claim 1, lines 3-5, is indefinite. It is not clear whether "frames of video images" refers to either full resolution frames or quarter resolution frames or to frames which contain both a full and a quarter resolution copy.

In claim 1, lines 8-15, and in claims 2, 3, 6 and 7 the use of the term "frame" is also indefinite. It becomes very confusing when "frame" seems to describe two different techniques of data storage. In the first case, "frame" seems to refer to data which contains both resolution copies and in the next case it seems to refer to separate full and reduced resolution "frames".